Express Mail Label No. EL 798 273 098 US

PATENT

Docket No. 11110.4.1

UNITED STATES PATENT APPLICATION

of

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for

BLOCK CONSTRUCTION SYSTEM

This application is a continuation-in-part of Application Serial No. 09/666,490 filed September 18, 2000, which is currently pending. The contents of Application Serial No. 09/666,490 are incorporated herein by reference.

FIELD OF THE INVENTION

The present invention pertains generally to concrete block construction systems. More particularly, the present invention pertains to blocks for constructing walls having mortarless joints. The present invention is particularly, but not exclusively, useful as a concrete block construction system having interlocking, self-aligning blocks.

BACKGROUND OF THE INVENTION

Traditionally, walls constructed using block required mortar joints between courses of blocks and between blocks within a course. One advantage of mortar joints is that they produce a wall having a somewhat aesthetically pleasing, decorative appearance. Specifically, the mortar joints reveal the block pattern (i.e. bond) of the wall, which is often desirable for architectural purposes. On the other hand, the use of mortar joints presents several disadvantages. For one, structures with mortar joints are expensive, in part due to the cost of the mortar material and the labor cost involved in preparing (i.e. mixing) the mortar at the construction site.

In addition to the cost of the mortar, construction using mortar joints tends to be expensive because it is time consuming to apply the mortar and then level and align each block. These construction steps are usually performed by a skilled mason who typically garners a relatively high hourly wage. Another disadvantage associated with a mortar joints is that mortar

joints are relatively weak as compared to the remainder of the structure. This is partially due to the fact that the mortar is prepared at the construction site, often under non-optimal conditions. Unlike the mortar joints, concrete blocks are generally strong because they are typically pressure molded at a factory in a controlled environment. Moreover, block walls with weak mortar joints are particularly susceptible to damage if the wall is shaken, for example, during a moderate to strong earthquake.

Mortarless joint construction block systems offer an alternative to the labor intensive process used to prepare structures with mortar joints. These mortarless joint systems often rely on specific features that are formed on the blocks to interlock the blocks and hold the resulting wall together. Once interlocked, a mortar mix can be pumped or poured into holes in the blocks in a relatively non labor-intensive process to produce a wall having excellent structural integrity. In some cases the blocks can be designed for construction of walls that are reinforced using re-bar.

Once the wall is erected, it is often covered with plaster to enhance its appearance. For plaster covered walls, the plaster functions to prevent water from entering the joint between blocks where the water can damage the structural integrity of the wall. On the other hand, it is somewhat costly and time consuming to plaster the entire outside surface of a wall. Accordingly, it is sometimes desirable to use a wall without plaster on some or all of the wall's outside surfaces. However, currently available mortarless joint systems do not effectively prevent water from seeping into the joints between blocks, and accordingly, these system require a surface coating such as plaster to ensure the structural integrity of the block wall is maintained.

Another important factor that must be considered in the design of interlocking block construction systems is their resistance to earthquakes. Strong earthquakes and some moderately strong earthquakes can shake a block wall causing rigid joints between blocks to fracture. Typical interlocking block systems do not allow for any movement at the joints between adjacent blocks. Because of this rigid structure, walls constructed using these systems tend to fail when exposed to moderately strong seismic activity. On the other

hand, the present invention recognizes that some movement between adjacent blocks (on the same course and between courses) can prevent cracking during seismic activity. In particular, the present invention recognizes that hinge-type movement between adjacent blocks can allow a wall to withstand relatively strong seismic activity without damage.

In light of the above, it is an object of the present invention to provide concrete block construction systems having interlocking, self-aligning blocks. It is another object of the present invention to provide block construction systems having mortarless joints which are designed to prevent water from seeping into joints between blocks. It is yet another object of the present invention to provide a block construction system for producing walls that can be used without failure in areas that experience frequent seismic activity. Yet another object of the present invention is to provide a block construction system which is easy to use, relatively simple to implement, and comparatively cost effective.

SUMMARY OF THE INVENTION

The present invention is directed to a block construction system having interlocking, self-aligning blocks that can be used to construct walls of various shapes and sizes. Because the blocks lock together, mortar joints between blocks are not required. A typical stretcher block for use in the system has the general shape of a rectangular parallelepiped and includes a top face and an opposed bottom face that each extend longitudinally from a first end face to a second end face. The stretcher block further includes opposed side faces that each extend from the first end face to the second end face.

To interlock and align stretcher blocks on successive courses, the top face of each stretcher block is formed with a pair of raised, substantially flat, substantially co-planar, horizontal portions that are positioned between a pair of longitudinally aligned edges. Each edge is rounded and extends downwardly from a respective flat portion to prevent water from seeping up

into the interface between stacked blocks. Between the flat portions, the top face is formed with a longitudinally aligned, rectangular shaped slot. The top face is further formed with a pair of substantially flat, horizontal stop surfaces that extend longitudinally on the top face. Each stop surface is positioned on the top face adjacent a respective rounded edge and thus, each rounded edge extends between a flat raised portion and a respective stop surface.

The bottom face of each stretcher block is formed with a pair of longitudinally aligned stop surfaces and a pair of substantially flat, substantially coplanar portions that are positioned between and recessed from the stop surfaces. The bottom face further includes a pair of curved surfaces that are each shaped to substantially conform to a respective rounded edge on the top face. Each curved surface extends downwardly from the flat portion to a respective stop surface. Between the flat portions, the bottom face is formed with a longitudinally aligned, rectangular shaped, segmented tongue which is positioned on the bottom face for insertion into the top-face slot of a block on an immediately lower course of blocks.

When a first stretcher block is stacked on a second stretcher block, the recessed portion of the top block receives and engages the raised portion of the bottom block preventing lateral movement of one block relative to the other. Also, the slot of the bottom block receives and engages the segmented tongue of the top block preventing lateral movement of one block relative to the other. In addition, the bottom face stop surfaces engage the top face stop surfaces to vertically self-align the first block with the second block. For the block construction system, the curved surfaces and rounded edges are formed with a relatively large radius of curvature, r, allowing for a minor adjustment in the vertical alignment of the blocks, if required.

To interlock adjacent blocks on a common course, the first end face of each stretcher block is formed with a vertically aligned tongue that is positioned approximately midway between the two sides of the block. The vertical tongue is formed with a tongue surface having a relatively large radius of curvature, R. More specifically, the tongue surface extends along the radius of curvature, R, approximately one-hundred eighty degrees (i.e. the

vertical tongue is shaped as a semi-circle in a horizontal cross-section through the tongue).

For the construction block system, the second end face of each stretcher block is formed with a vertically aligned groove having a groove surface substantially conformal with the tongue surface. With this cooperation of structure, the vertical groove can receive and engage the vertical tongue of an adjacent block on a common course and establish a hinge joint therebetween. The hinge joint self-aligns and locks the blocks together preventing lateral movement of one block relative to the other, but allows for a minor adjustment in the lateral alignment of the blocks, if required. In addition, the relatively large radius hinge joint accommodates minor vibrations without joint rupture (such as the vibration that may occur during a moderate to strong earthquake).

Other block configurations having some or all of the interlocking structures described above can be included in the block construction system. These other blocks include half-stretchers, end blocks, corner blocks, bond beam blocks, tee blocks, crossing blocks and other specialty blocks. The different block configurations can be combined to construct walls of various shapes and sizes. To accommodate mortar and vertical re-bar, each block is formed with one or more holes to establish vertically aligned passageways. Bond beam blocks are provided for use on selected courses to accommodate horizontal re-bar.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of this invention, as well as the invention itself, both as to its structure and its operation, will be best understood from the accompanying drawings, taken in conjunction with the accompanying description, in which similar reference characters refer to similar parts, and in which:

Fig. 1 is a front perspective view of a stretcher block for use in a mortarless joint block construction system;

Fig. 2 is a rear perspective view of the stretcher block shown in Fig. 1;

Fig. 3 is a cross sectional view of a pair of stacked blocks as would be seen along line 3-3 in Fig. 2;

Fig. 4 is a bottom plan view of the stretcher block shown in Fig. 1;

Fig. 5 is a top plan view of a pair of adjacent blocks in a common course;

Fig. 6 is a front perspective view of a half-stretcher block for use in a mortarless joint block construction system;

Fig. 7 is a front perspective view of a corner block for use in a mortarless joint block construction system;

Fig. 8 is a front perspective view of a tee block for use in a mortarless joint block construction system;

Fig. 9 is a rear perspective view of the tee block shown in Fig. 8;

Fig. 10 is a top plan view of a course of blocks having stretcher blocks, a right corner block and a tee block;

Fig. 11 is a front perspective view of a cross block for use in a mortarless joint block construction system;

Fig. 12 is a front perspective view of a bond block for use in a mortarless joint block construction system;

Fig. 13 is a front perspective view of a block for use in a mortarless joint block construction system having vertical re-bar;

Fig. 14 is a front perspective view of a 45° block for use in a mortarless joint block construction system;

Fig. 15 is a front perspective view of an end block for use in a mortarless joint block construction system;

Fig. 16 is a front perspective view of a block formed with an opening for accommodating an electrical outlet;

Fig. 17 is a front perspective view of a block formed with an opening for accommodating a plumbing line;

Fig. 18 is a front perspective view of an indoor block for use in a mortarless joint block construction system;

Fig. 19 is a perspective view of a structure for reinforcing a block wall; and

Fig. 20 is a side view of a block wall incorporating the reinforcing structure shown in Fig. 19.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 and 2, a stretcher block for use in a block construction system is shown and generally designated 100. As shown in Figs. 1 and 2, the stretcher block 100 includes a top face 102 and an opposed bottom face 104 that each extend longitudinally from an end face 106 to an end face 108. The stretcher block 100 shown in Figs. 1 and 2 further includes opposed side faces 110, 112 that each extend from the end face 106 to the end face 108.

With cross-reference to Figs. 1 and 3, it can be seen that the top face 102 of each stretcher block 100a,b is formed with raised portions 114a,b that are substantially flat, substantially coplanar and are oriented substantially horizontally. Also shown, the raised portions 114a,b extend between a pair of longitudinally aligned edges 116a,b. Each edge 116a,b is rounded and extends downwardly from a respective raised portion 114a,b to prevent water from entering the interface between stacked blocks 100a,b. The top face 102 is further formed with a pair of substantially flat horizontal stop surfaces 118a,b that each extend longitudinally on the top face 102. Each stop surface 118a,b is positioned on the top face 102 adjacent a respective rounded edge 116a,b and thus, each rounded edge 116a,b extends between the flat raised portion 114 and a respective stop surface 118a,b. The top face 102 is also formed with a longitudinally aligned, rectangular shaped slot 119 that is positioned substantially midway between the side faces 110, 112 and separates raised portion 114a from raised portion 114b.

Continuing with cross-reference to Figs. 1 and 3, it can be seen that the bottom face 104 of each stretcher block 100 is formed with a pair of longitudinally aligned stop surfaces 120a,b and two recessed portions 122a,b that are substantially flat, substantially coplanar and are both positioned between and recessed from the stop surfaces 120a,b. The bottom face 104 further includes a pair of curved surfaces 124a,b that are shaped to substantially conform to the rounded edges 116a,b on the top face 102, as shown. Further, each curved surface 124a,b extends downwardly from the recessed portion 122 to a respective stop surface 120a,b. Also, as best seen with cross reference to Figs. 3 and 4, the bottom face 104 is formed with a longitudinally aligned, rectangular shaped tongue 125 made up of tongue segments 125a-c which are positioned on the bottom face 104 and sized for insertion into the slot 119 of a block 100 on an immediately lower course of blocks 100.

As best seen in Fig. 3, when stretcher block 100a is stacked on stretcher block 100b, the recessed portions 122a,b of block 100a receive and engage the raised portions 114a,b of block 100b preventing lateral movement (i.e. movement in the direction of arrow 126) of block 100a relative to block 100b. Also, the slot 119 of block 100b receives and engages one or more of the tongue segments 125a-c of the block 100a, also preventing lateral movement of block 100a relative to block 100b. In addition, as shown in Fig. 3, the bottom face stop surfaces 120a,b engage respective top face stop surfaces 118a,b to vertically self-align block 100a on block 100b.

Fig. 3 shows that the curved surfaces 124a,b and rounded edges 116a,b are formed with a relatively large radius of curvature, r. This relatively large radius of curvature, r allows for a minor adjustment in the vertical alignment of the blocks 100a,b, if required, and provides for a stable hinge joint between stacked blocks 100a,b. The hinge joint allows a minor rotation of block 100a relative to 100b during shaking of a wall made of the blocks 100, for example, during seismic activity. Specifically, for a block 100 having a width, w, (see Fig. 4), the curved surfaces 124a,b typically have a radius of curvature, r, that is greater than approximately one twelfth of the block width (r

> w /12). For example, for a block 100 having a width, w, of approximately six inches (6"), the radius of curvature, r, is typically about one-half inches (r $\approx$ 0.5").

Fig. 3 shows that the sides 110, 112 of each block 100 are formed with a notch 128 immediately below each top face stop surface 118a,b to create a longitudinally aligned channel 130 with a bottom face stop surface 120a,b. The longitudinally aligned channel 130 is provided to simulate a decorative mortar joint between stacked blocks 100a and 100b. The channel 130 can be filled with mortar to simulate a mortar joint or can be left un-filled in which case the downward sloping curved surfaces 124 prevent water from seeping upward into the joint between blocks 100a and 100b.

Fig. 5 shows two adjacent blocks 100c and 100d in a common course. As shown, the end face 106 of each stretcher block 100 is formed with a vertically aligned tongue 132 (see also Fig. 1) that is positioned approximately midway between the two sides faces 110, 112. As further shown, the tongue 132 is formed with a tongue surface 134 having a relatively large radius of curvature, R. More specifically, the tongue surface 134 extends along the radius of curvature, R, approximately one-hundred eighty degrees. Thus, it can be seen that the tongue 132 is shaped as a semi-circle in a horizontal cross-section through the tongue 132.

Cross referencing Figs. 2 and 5, it can be seen that the end face 108 of each stretcher block 100 is formed with a vertically aligned groove 136 having a groove surface 138 that is substantially conformal with the tongue surface 134. With this cooperation of structure, the groove 136 of block 100d closely receives and engages the tongue 132 of block 100c and prevents lateral movement of block 100c relative to the block 100d (i.e. movement in the direction of arrow 140 is prevented). Flat surfaces 142a,b (shown in Fig. 1) interact with respective flat surfaces 144a,b (shown in Fig. 2) to longitudinally align adjacent blocks 100c,d.

Fig. 5 shows that the tongue surface 134 and groove surface 138 are formed with a relatively large radius of curvature, R. Note: typically the groove surface 138 is formed with a slightly larger radius than the tongue

surface 134 to ensure an easy fit between the tongue 132 and groove 136. The relatively large radius of curvature, R, allows for a minor adjustment in the longitudinal alignment of adjacent, common course blocks 100c,d, if required, and provides for a stable hinge joint between adjacent, common course blocks 100c,d. The hinge joint allows a minor rotation of block 100c relative to 100d during shaking of a wall made of the blocks 100, for example, during seismic activity. Specifically, for a block 100 having a width, w, the tongue surface 134 typically has a radius of curvature, R, that is greater than approximately one fourth of the block width ($R > w / 4$). For example, for a block 100 having a width, w, of approximately six inches (6"), the radius of curvature, r, is typically about one and one-half inches ($r \approx 1.5"$).

Fig. 5 shows that the sides 110, 112 of each block 100 are formed with notches 146a-d to create vertically aligned channels 148a,b between adjacent, common course blocks 100c,d. The vertically aligned channels 148a,b are provided to simulate a decorative mortar joint between adjacent, common course blocks 100c,d. The channel 148 can be filled with mortar to simulate a mortar joint or can be left un-filled. In some cases, the side surfaces 110, 112 including the channels 130, 148a and 148b can be covered with plaster after wall construction to enhance the appearance of the wall.

As best seen in Fig. 1, the block 100 is formed with two holes 149a,b which extend vertically through the block 100. These holes 149a,b reduce the weight of the block 100 as well as the amount of material needed to make the block 100. In addition, the holes 149a,b are positioned for alignment with holes 149a,b of blocks 100 on adjacent block courses to establish vertically aligned passageways that can be filled with mortar, and in some cases, re-bar to strengthen the wall.

Referring now to Fig. 6, a half-stretcher block 200 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 6, the half-stretcher block 200 includes a top face 202 and an opposed bottom face 204 that each extend longitudinally from an end face 206 to an end face 208. As further shown, the top face 202 is formed with flat, raised portions 214a,b, and longitudinally aligned edges 216a,b that are

rounded and extend downwardly from a respective raised portion 214a,b to prevent water from entering the interface between stacked blocks 200. The top face 202 is further formed with a pair of substantially flat horizontal stop surfaces 218a,b and a longitudinally aligned, rectangular shaped slot 219.

Continuing with reference to Fig. 6, it can be seen that the bottom face 204 is formed with a pair of longitudinally aligned stop surfaces 220a,b, two flat, recessed portions 222a,b and a pair of curved surfaces 224a,b that are shaped to substantially conform to the rounded edges 216a,b on the top face 202, as shown. Also, the bottom face 204 is formed with a longitudinally aligned, rectangular shaped tongue 225 sized for insertion into a corresponding slot 219. Fig. 6 shows that the block 200 is formed with a notch 228 immediately below each top face stop surface 218a to create a decorative mortar joint. In addition, the end face 206 is formed with a vertically aligned groove 236a and the end face 208 is formed with a vertically aligned groove 236b, each sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1. It is to be appreciated that the above described cooperation of structure allows the half-stretcher block 200 to be used in a wall together with other blocks in the system such as block 100 described in detail above. Specifically, the block 200 can be stacked above or below a block 100 or can be positioned adjacent to a block 100 on a common course.

Referring now to Fig. 7, a corner block 300 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. It is to be appreciated that corner block 300 shown is a left corner block and that a typical block construction system would include both left and right corner blocks. As shown in Fig. 7, the corner block 300 includes a top face 302 and an opposed bottom face 304 that each extend longitudinally from an end face 306 to a substantially flat end face 308. As further shown, a portion of the top face 302 is formed with flat, raised portions 314a,b, longitudinally aligned edges 316a,b that are rounded and extend downwardly from a respective raised portion 314a,b to prevent water from entering the interface between stacked blocks 300. The top face 302 is further formed with a pair of

substantially flat horizontal stop surfaces 318a,b and a longitudinally aligned, rectangular shaped slot 319. Also shown, the top face 302 includes a substantially flat corner portion 150.

Continuing with reference to Fig. 7, it can be seen that a portion of the bottom face 304 is formed with a pair of longitudinally aligned stop surfaces 320a,b, two flat, recessed portions 322a,b and a pair of curved surfaces 324a,b that are shaped to substantially conform to the rounded edges 316a,b on the top face 302, as shown. Also, a portion of the bottom face 304 is formed with a longitudinally aligned, rectangular shaped tongue 325 sized for insertion into a corresponding slot 319. Fig. 7 shows that the block 300 is formed with a notch 328 immediately below each top face stop surface 318a to create a decorative mortar joint. In addition, the bottom face 304 is formed with a substantially flat corner portion 152 to correspond with a substantially flat corner portion 150 of a top surface 302 when one corner block 300 is stacked on another corner block 300. In addition, the end face 306 is formed with a vertically aligned groove 336a sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1.

Continuing with Fig. 7, it can be seen that the corner block includes a substantially flat side face 310 and a side face 312 having a substantially flat portion 156. Side face 312 is also formed with flat surfaces 158a,b, which project slightly from the flat portion 156, and groove 336b that is sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1. It is to be appreciated that the above-described cooperation of structure allows the corner block 300 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Figs. 8 and 9, a tee block 400 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Figs. 8 and 9, the tee block 400 includes a top face 402 and an opposed bottom face 404 that each extend longitudinally from an end face 406 to an end face 408. As further shown, a portion of the top face 402 is formed with flat, raised portions 414a,b, longitudinally aligned edges 416a,b that are rounded and extend downwardly from a respective raised portion

414a,b to prevent water from entering the interface between stacked blocks 400. The top face 402 is further formed with a pair of substantially flat, horizontal stop surfaces 418a,b and a longitudinally aligned, rectangular shaped slot 419. Also shown, the top face 402 includes a substantially flat tee portion 160.

Continuing with reference to Figs. 8 and 9, it can be seen that a portion of the bottom face 404 is formed with a pair of longitudinally aligned stop surfaces 420a,b, two flat, recessed portions 422a,b and a pair of curved surfaces 424a,b that are shaped to substantially conform to the rounded edges 416a,b on the top face 402, as shown. Also, a portion of the bottom face 404 is formed with a longitudinally aligned, rectangular shaped tongue 425 sized for insertion into a corresponding slot 419. Figs. 8 and 9 show that the block 400 is formed with a notch 428 immediately below top face stop surface 418b to create a decorative mortar joint. In addition, the bottom face 404 is formed with a substantially flat tee portion 162 to correspond with a substantially flat tee portion 160 of a top surface 402 when one tee block 400 is stacked on another tee block 400. In addition, the end face 406 is formed with a vertically aligned groove 436a sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1. Also, end face 408 is formed with a vertically aligned groove 436b sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1.

Continuing with Figs. 8 and 9, it can be seen that the tee block 400 includes a substantially flat side face 410 and a side face 412 having a substantially flat portion 164. Side face 412 is also formed with flat surfaces 166a,b, which project slightly from the flat portion 164, and groove 436c that is sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1. It is to be appreciated that the above-described cooperation of structure allows the tee block 400 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Fig. 10 shows a portion of a course of blocks having stretcher blocks 100', a right corner block 300' and a tee block 400'. From Fig. 10, it can be seen that where an end face such as end face 106' having groove 136' is

stacked against an end face 306' having groove 336a', the grooves 136', 336' form a cylindrical void 168 that can be filled with mortar to prevent lateral movement of block 100' relative to corner block 300'.

Referring now to Fig. 11, a cross block 500 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 11, the cross block 500 includes a top face 502 which includes a first portion 170 having a profile similar to the profile of the top face 102 of block 100 shown in Fig. 1 and a second flat portion 172. Cross block 500 also includes end faces 506, 508 that are similar to end faces 106, 108 of block 100 shown in Fig. 1. Also, it can be seen that the cross block 500 includes side faces 510 and 512 that each have a substantially flat portion 174, 176 and a pair of flat surfaces which project slightly from a respective flat portion 174, 176, and each have a groove 536a,b that is sized to closely receive a corresponding tongue, such as the tongue 132 of block 100 shown in Fig. 1. It is to be appreciated that the above-described cooperation of structure allows the cross block 500 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 12, a bond block 600 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 12, the bond block 600 includes a side faces 610, 612 which are similar to the respective side faces 110, 112 of block 100 shown in Fig. 1. However, as shown, the block 600 has been formed with support surfaces 178a-c at the approximate mid-height of the block 600 to support horizontally oriented re-bar. It is to be appreciated that the above-described cooperation of structure allows the bond block 600 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 13, a block 700 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 13, the block 700 is formed with a cutout 180 to accommodate vertically oriented re-bar. Specifically, the cutout 180 allows a piece of vertically oriented re-bar to be placed in the channel 748 without requiring the block 700 to be lifted above the vertically oriented re-bar. It is to be appreciated that the

above-described cooperation of structure allows the block 700 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 14, a 45° block 800 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 14, the 45° block 800 includes end faces 806, 808 which are similar to the respective end faces 106, 108 of block 100 shown in Fig. 1. However, as shown, the block 800 has been formed with end face 806 oriented at an angle of approximately 45° relative to end face 808. It is to be appreciated that the above-described cooperation of structure allows the 45° block 800 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 15, an end block 900 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 15, the end block 900 extends from end face 906 (which is similar to the end face 106 of block 100 shown in Fig. 1) to a flat end face 908. It is to be appreciated that the above-described cooperation of structure allows the end block 900 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 16, a block 1000 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 16, the block 1000 is similar to block 100 shown in Fig. 1, but is formed with an opening 182 on side face 1010 for accommodating an electrical outlet (not shown). Specifically, an electrical receptacle can be disposed in opening 182 and wires from the receptacle can be routed through hole 1049. It is to be appreciated that the above-described cooperation of structure allows the block 1000 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 17, a block 1100 for use in a block construction system, for example with block 100 (see Fig. 1) is shown. As shown in Fig. 17, the block 1100 is similar to block 100 shown in Fig. 1, but is formed with

an opening 184 on side face 1112 for accommodating a plumbing line (not shown). Specifically, a plumbing line such as a pipe can be routed within the wall through hole 1149 for exit from the wall through opening 184. It is to be appreciated that the above-described cooperation of structure allows the block 1100 to be used in a wall together with other blocks in the system such as blocks 100 or 200 described above.

Referring now to Fig. 18, a block 1200 for use in an indoor block construction system is shown. As shown in Fig. 18, the block 1200 is somewhat similar to block 100 shown in Fig. 1, but typically has a width, w (see Fig. 4) of about four inches. As shown, block 1200 includes a top face 1202 and an opposed bottom face 1204 that each extend longitudinally from an end face 1206 to an end face 1208. As further shown, the top face 1202 is formed with flat, raised portions 186a-c, longitudinally aligned edges 188 (for which exemplary edges 188a and 188b have been labeled) that are rounded and extend downwardly from a respective raised portion 186. The top face 1202 is further formed with a pair of substantially flat horizontal stop surfaces 1218a,b.

Continuing with reference to Fig. 18, it can be seen that the bottom face 1204 is formed with a pair of longitudinally aligned stop surfaces 1220a,b, flat, recessed portions 190 and curved surfaces 192 that are shaped to substantially conform to the rounded edges 188 on the top face 1202, as shown. In addition, the end face 1208 is formed with a vertically aligned tongue 1232 and the end face 1206 is formed with a vertically aligned groove 1236 sized to closely receive a corresponding tongue 1232, for example, from another block 1200.

Referring now to Figure 19, a reinforcing system is shown and generally designated 2200. System 2200 includes an upper plate 2202, a lower plate 2204, and a connecting bar 2206 which extends vertically between the lower plate 2204 and the upper plate 2202.

Upper plate 2202 is formed with a surface 2208 which is shaped and sized to conform to the top face 102 of a construction block 100 (Fig. 1). Similarly, lower plate 2204 is formed with a surface 2210 that is shaped and

sized to at least partially conform to the bottom face 104 of a block 100. Lower plate 2204 may also be formed with one or more mounting holes 2212 to facilitate nailing, screwing, or otherwise attaching lower plate 2204 to the ground. Also, lower plate 2204 may be formed with a threaded hole 2218 to receive the end of connecting bar 2206 that is formed with corresponding threads. The upper end of connecting bar 2206 may be formed with thread 2214 to receive a threaded nut 2216 once the connecting bar 2206 has been inserted through hole 2219 formed in the upper plate 2202. In a preferred embodiment, connecting bar 2206 may be constructed of several shorter bar segments 2206a, 2206b, and 2206c. In this manner, as will be discussed in greater detail below in conjunction with Fig. 20, the connecting bar 2206 may be installed into a wall constructed of the building blocks of the present invention once the wall is fully erected.

Referring now to Fig. 20, a wall constructed of the building blocks 100 of the present invention, and incorporating the reinforcing system 2200 is shown with the vertical connecting bar 2206 shown in phantom. In use, the lower plate 2204 is positioned in place, and then a wall is constructed, such as the wall shown constructed of blocks 100 of the present invention.

Once the wall has been completed, the vertical connecting bar 2206 is inserted down into the holes 149 of blocks 100 and threaded into threaded hole 2218. The construction of vertical connecting bar 2206 from several smaller pieces of bar, such as shown by vertical connecting bar pieces 2206a, 2206b and 2206c, allow for the insertion of a full-length connecting bar 2206, despite construction of a wall of the present invention in locations with limited clearance above the walls.

Once the vertical connecting bar 2206 has been properly attached to lower plate 2204, upper plate 2202 is positioned on top of the blocks 100 such that the vertical connecting bar 2206 extends through hole 2219 and rests on the top face 102 of the block 100. Once the upper plate 2202 is in position atop block 100, nut 2216 is threaded onto threads 2214 of connecting bar 2206 and tightened. As the nut 2216 tightens, the blocks 100 of the wall are captured firmly between the upper plate 2202 and the lower plate 2204

thereby preventing the relative movement of any block 100 within the wall. In fact, several reinforcing systems 2200 may be used in the same wall to provide for a block construction system which does not need mortar or concrete encased rebar in order to maintain its structural rigidity. Also, by not using any concrete or mortar in the formation of a wall incorporating the building blocks of the present invention, the wall may be erected, equipped with the reinforcing system 2200, and used for an extended period of time, yet providing for the easy demolition, removal, and re-use of the blocks 100.

While the particular block construction system as herein shown and disclosed in detail is fully capable of obtaining the objects and providing the advantages herein before stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as described in the appended claims.